INTER-COMPANY CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY

A Division of Union Carbide and Carbon Corporation

3352

To: Those Listed

Plant: Y-12

Date: March 14, 1956

Subject: Solvent Losses Through Ventilation Exhaust Systems Building 9201-5

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SURVEY

In order (a) to arrive at a more comprehensive analysis of the mercury losses sustained in the operation of the Alpha-5 process, (b) to determine the effectiveness of the clean-up program, and (c) to determine the effectiveness of the ventilation facilities, a survey was made in Bldg. 9201-5 during the period between January 26 and February 8, 1956, inclusive. This survey entailed a series of readings taken at all points at which air is exhausted from contaminated areas of the building. The readings represented the concentration of mercury in milligrams per cubic meter of air exhausted at these points.

Readings in concentration of mercury ranged from 0 to 1.3 mg/M^3 of air. However, the most significant losses were not necessarily those where readings of highest concentrations were indicated, but rather at points of relatively lower concentrations which were coupled with large volumes of air being exhausted. For example, the hydrogen vent system showed a concentration of 1.3 mg/M^3 of gas, yet the loss per day was only 0.146 pounds of mercury, due to the fact that the volume of gas exhausted through the vent was only 1250 cfm. The greatest loss per day - 1.6 pounds - was found to be through the louvers in the south wall at the south end of the West Crane Bay, even though the concentration was only 0.1 mg/M^3 of air. The volume of air exhausted in this area totaled 187,000 cfm.

No readings were taken at the north and south louvers of the East Crane Bay because of the cascade rupture in December which contaminated the supply air system for the motor-generator Group #3. In order to supply air for these MG sets, the roof was removed from the MG room, thus allowing Cascade air to be exhausted through the MG sets. This, of course, would distort the value of any readings taken in the East Crane Bay.

Location of all points checked were systematically recorded and tabulated. Necessary conversions were made and calculations completed on losses in terms of pounds of mercury per day at each point.

RESULTS

A summation was made of the individual losses at each point of exhaust which gave a total of 22.5 pounds of mercury lost per day through the exhaust facilities of the building, or 8200 pounds per year, based on these readings.

ANALYSIS

Results of the survey, relative to quantities of mercury lost, cannot be conclusive since concentrations vary from day to day by as much as 400% in some areas. Therefore, the readings for any specific day cannot be extrapolated to determine mercury losses for the entire year. A more representative figure on these losses can be obtained by averaging the readings taken over an extended period of time and making calculations from the overall average concentrations for that period.

From a statement below and from Table II, it is evident that the concentration of mercury in the air exhausted from the building is approximately the same as that in the breathing zone, major exceptions being the spot-vented areas. Therefore, it can be shown that mercury losses may be computed from breathing zone averages taken over an extended period of time, and that these will be more realistic than computations made from data taken on any specific date. In this respect, Table I, prepared from breathing zone readings of mercury concentrations during the months of October, November and December show a greater mercury loss per day than that computed from the survey data explained above.

TABLE I

Area	Cfm Air Exhausted	Av.Hg Concentration mg/M^3 air (3 Months)	Pounds Hg Lost per day
Absorbers 1 & 2	292,000	0.18	4.73
Absorbers 3 & 4	292,000	0.18	4.73
Absorbers 5 & 6	282,000	0.12	3.04
Absorbers and Inj. 1A	50,000	0.28	1.26
Injection Pumps 1 & 2	24,000	0.30	0.65
Injection Pumps 3 & 4	24,000	0.25	0.54
Injection Pumps 5 & 6	25,600	0.53	1.22
Chemical Recovery	25,000	0.19	0.43
Feed Storage	50,000	0.25	1.13
Feed Prep. & Extraction	35,000	0.10	0.32

TABLE I (cont'd)

Area	Cfm Air Exhausted	Av. Hg Concentration mg/M^3 air (3 Months)	Pounds Hg. Lost per day
Cascades 1 & 3			
1st Floor	54,000	0.20	0.97
2nd Floor	60,000	0.26	1.40
3rd & 4th Floors	257,000	0.21	4.86
Cascades 2 & 4			
1st Floor	54,000	0.21	1.02
2nd Floor	60,000	0.26	1.40
34d & 4th Floors	257,000	0.18	4.16
Cascades 5 & 6			
All Floors	545,000	0.13	6.38
		Total	38.24

A second point may be significant from the foregoing calculations made from data collected over the months of October, November and December as compared to the calculations made from survey data taken January 26 through February 8. Since the latter shows a decrease in calculated daily mercury losses; some of this decrease may be attributed to the effectiveness of the clean-up program; however, the extent of this could be evaluated further by another survey conducted on a similar basis as the one recently made.

Further analysis of the data obtained in this survey, when compared with readings taken on breathing zone concentrations for corresponding dates, gives a positive indication that short cycling of supply air to the exhaust air system is not significant. In order to substantiate this, comparative data has been tabulated in Table II which shows that the mercury concentration of air exhausted is approximately the same as the mercury concentrations in the corresponding breathing zone areas of the building. It will be noted that readings at only those points of exhaust from spot-vented areas vary seriously from the average breathing zone concentrations; this is as expected and does not contradict the basis for the conclusions.

TABLE II

Area	Cfm Air Exhausted (Based on summer volumes)	Daily Av. Breathing Zone Concentrations Mg/M^3 Air	Av. Readings Exh. Air Conc., Mg/M^3 Air
Absorbers 1 & 2	292,000	0.12	0.10
Absorbers 3 & 4	292,000	0.08	0.08
Absorbers 5 & 6	282,000	0.08	0.07
Absorbers 1A	50,000	0.16	0.18 **

[redacted]

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TABLE II (cont'd)

Area	Cfm Air Exhausted (Based on summer volumes)	Daily Av. Breathing Zone Concentrations Mg/M3 Air	Av. Readings Exh. Air Conc., Mg/M3 Air
Injection Pumps 1 & 2	24,000	0.16	0.21 **
Injection Pumps 3 & 4	24,000	0.18	0.24 **
Injection Pumps 5 & 6	25,000	0.11	0.21 **
Chemical Recovery	24,000	0.06	0.11 **
Feed Storage	50,000	0.09	0.18 *
Feed Prep. & Extraction	35,000	0.10	0.06
Cascades 1 & 3			
1st Floor	54,000	0.10	0.03
2nd Floor	60,000	0.14	0.08
3rd & 4th Floors	257,000	0.21	0.09
Cascades 2 & 4			
1st Floor	54,000	0.08	0.03
2nd Floor	60,000	0.16	0.13
3rd & 4th Floors	257,000	0.13	0.10
Cascades 5 & 6			
All Floors	545,000	0.09	0.09

* This average includes Absorber 1A exhaust; therefore, is not necessarily representative for Feed Storage.

** These readings are for spot exhaust systems from major sources of contamination.

CONCLUSIONS

(a) Based on readings taken during this survey, mercury losses through the ventilation exhaust system of Building 9201-5 total 22.5 pounds per day.

(b) Based on the above analysis and comparative data in Table II, it is evident that the clean-up program has reduced mercury losses through exhaust facilities of the building.

(c) Since the ventilation exhaust system is discharging approximately the same concentration of mercury as is found at breathing zone levels, it is evident that short cycling of fresh air from the air supply system directly to the exhaust facilities is not significant.

A similar survey will be made in Bldg. 9201-4 as soon as the new ventilation facilities now under construction are completed.

Approved: [redacted]